

CE EMC TEST REPORT (EN 50155)

REPORT NO.: CE991022C10 R1

MODEL NO.: R10IA3S-VMP1; R10XXXX-XXXXXX
(X=A~Z, a~z, 0~9, Blank or Slash);
GWIN; GWINXX-XXXXXX
(X=A~Z, a~z, 0~9, Blank or Slash)

RECEIVED: Oct. 22, 2010

TESTED: Oct. 27, 2010 ~ Jan. 19, 2011

ISSUED: Jan. 28, 2011

APPLICANT: WinMate Communication INC.

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ISSUED BY: Bureau Veritas Consumer Products Services
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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	Jan. 24, 2011
CE991022C10 R1	Change model	Jan. 28, 2011

1 CERTIFICATION

PRODUCT: 10.4 Rugged Panel PC
BRAND: Winmate
MODEL: R10IA3S-VMP1; R10XXXX-XXXXXX (X=A~Z, a~z, 0~9, Blank or Slash); GWIN; GWINXX-XXXXXX (X=A~Z, a~z, 0~9, Blank or Slash)
APPLICANT: WinMate Communication INC.
TESTED: Oct. 27, 2010 ~ Jan. 19, 2011
TEST SAMPLE: ENGINEERING SAMPLE
STANDARD: **EN 50155: 2007**
EN 50121-1: 2006 (2006-07)
EN 50121-3-2: 2006 (2006-07)
EN 55011: 2007+A2: 2007
EN 61000-4-2: 2009
EN 61000-4-3: 2006+A1: 2008
EN 61000-4-4: 2004
EN 61000-4-5: 2006
EN 61000-4-6: 2009

The above equipment (model: R10IA3S-VMP1) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY :  , DATE : Jan. 28, 2011
Joanna Wang / Senior Specialist

APPROVED BY :  , DATE : Jan. 28, 2011
David Liu / Senior Engineer

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

EMISSION				
EN 50155 Reference Clause(s)	Reference Standard	Test Type	Result	Remarks
12.2.8.2	EN 50121-3-2: 2006 (2006-07)	Power line conducted emission measurement	PASS	Meets Limit. Minimum passing margin is -21.11dB at 0.205MHz.
	EN 55011: 2007+A2: 2007	Radiated emission measurement	PASS	Meets Limit. Minimum passing margin is -5.82dB at 39.72MHz.

IMMUNITY				
EN 50155 Reference Clause(s)	Reference Standard	Test Type	Result	Remarks
12.2.7.2	EN 50121-3-2: 2006 (2006-07) EN 61000-4-2: 2009	Electrostatic discharge immunity test	PASS	Meets the requirements of Performance Criterion B
12.2.8.1	EN 50121-3-2: 2006 (2006-07) EN 61000-4-3: 2006+A1: 2008	Radio-frequency, electromagnetic field immunity test	PASS	Meets the requirements of Performance Criterion A
12.2.7.3	EN 50121-3-2: 2006 (2006-07) EN 61000-4-4: 2004	Transient burst susceptibility test	PASS	Meets the requirements of Performance Criterion A
12.2.7.1	EN 50121-3-2: 2006 (2006-07) EN 61000-4-5: 2006	Surge immunity test	PASS	Meets the requirements of Performance Criterion A
12.2.8.1	EN 50121-3-2: 2006 (2006-07) EN 61000-4-6: 2009	Radio-frequency, conducted disturbances immunity test	PASS	Meets the requirements of Performance Criterion A

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

MEASUREMENT	FREQUENCY	UNCERTAINTY
Conducted emission	9kHz ~ 30MHz	2.44dB
Radiated emission	30MHz ~ 1GHz	4.12dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	10.4 Rugged Panel PC
MODEL NO.	R10IA3S-VMP1; R10XXXX-XXXXXX (X=A~Z, a~z, 0~9, Blank or Slash); GWIN; GWINXX-XXXXXX (X=A~Z, a~z, 0~9, Blank or Slash)
POWER SUPPLY	24Vdc
DATA CABLE	0.15m shielded PS/2 cable without core
ACCESSORY DEVICE	NA

NOTE:

- The following models are provided to this EUT.

MODEL	DESCRIPTION
R10IA3S-VMP1	All models are electrically identical, different model names are for marketing purpose.
R10XXXX-XXXXXX (X=A~Z, a~z, 0~9, Blank or Slash)	
GWIN	
GWINXX-XXXXXX (X=A~Z, a~z, 0~9, Blank or Slash)	

*The model: R10IA3S-VMP1 was chosen for the final test and presented in the test report.

- The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

The EUT has been pre-tested under following test modes, and test mode 1 was the worst case for final test.

Test Mode	Test Condition
1	Full system, Run BurnIn test, LAN 1Gbps, 800*600@60Hz
2	Full system, Run BurnIn test, LAN 100Mbps, 800*600@60Hz
3	Full system, Run BurnIn test, LAN 10Mbps, 800*600@60Hz
4	Full system, Run BurnIn test, LAN 1Gbps, 640*480@60Hz

3.3 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

3.3.1 FOR EMISSION TEST

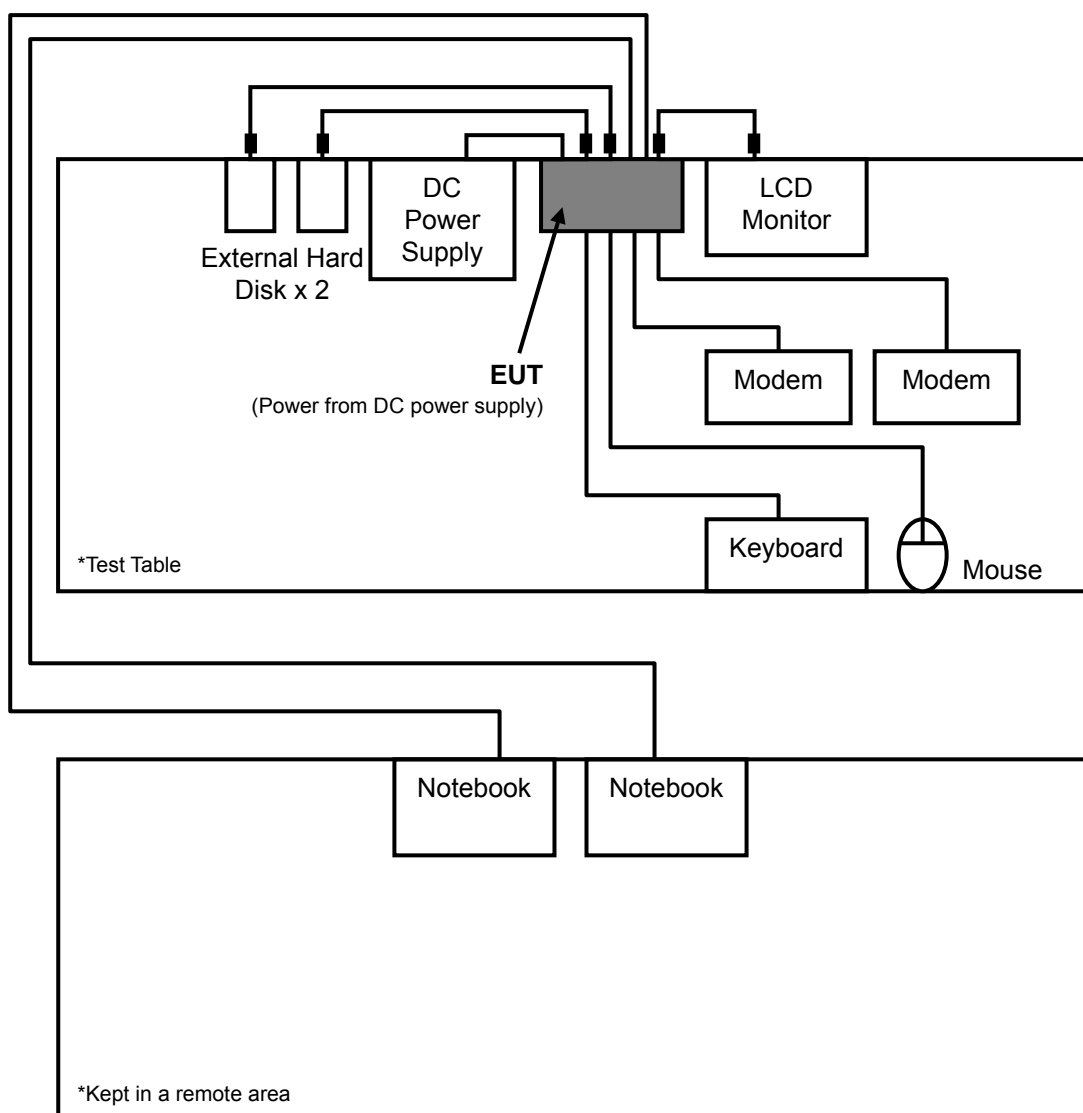
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	LCD MONITOR	DELL	2407WFPb	CN-0FC255-46633-718-0ANS	FCC DoC Approved
2	MODEM	ACEEX	1414V/3	0401008252	IFAXDM1414
3	MODEM	ACEEX	1414V/3	0401008270	IFAXDM1414
4	KEYBOARD	DELL	SK-8110	MY-05N456-71619-3C1-1801	FCC DoC Approved
5	MOUSE	DELL	M071KC	504008965	FCC DoC Approved
6	EXTERNAL HARD DISK	DELL	RD1000	HK-0XM763-72953-77Q-001E	NA
7	EXTERNAL HARD DISK	DELL	RD1000	HK-0XM763-72953-77Q-0001	NA
8	DC POWER SUPPLY	TOP WARD	TF-6603A	725942	NA
9	NOTEBOOK	DELL	D600	F8HBC1S	E2K24CLNS
10	NOTEBOOK	DELL	PP05L	27368374672	E2K24CLNS

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8m braid shielded wire, D-SUB connector, with two cores.
2	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.
3	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.
4	2m foil shielded wire, PS/2 Connector, w/o core.
5	2m foil shielded wire, PS/2 Connector, w/o core.
6	2m shielded cable, terminated with USB connector, with two cores.
7	2m shielded cable, terminated with USB connector, with two cores.
8	NA
9	10m RJ45 UTP cable.
10	10m RJ45 UTP cable.

NOTE:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 9~10 acted as a communication partners to transfer data.
3. Item 8 was under test table during conducted emission test.

TEST CONFIGURATION



NOTE: The DC power supply was under test table during conducted emission test.

3.3.2 FOR IMMUNITY TEST

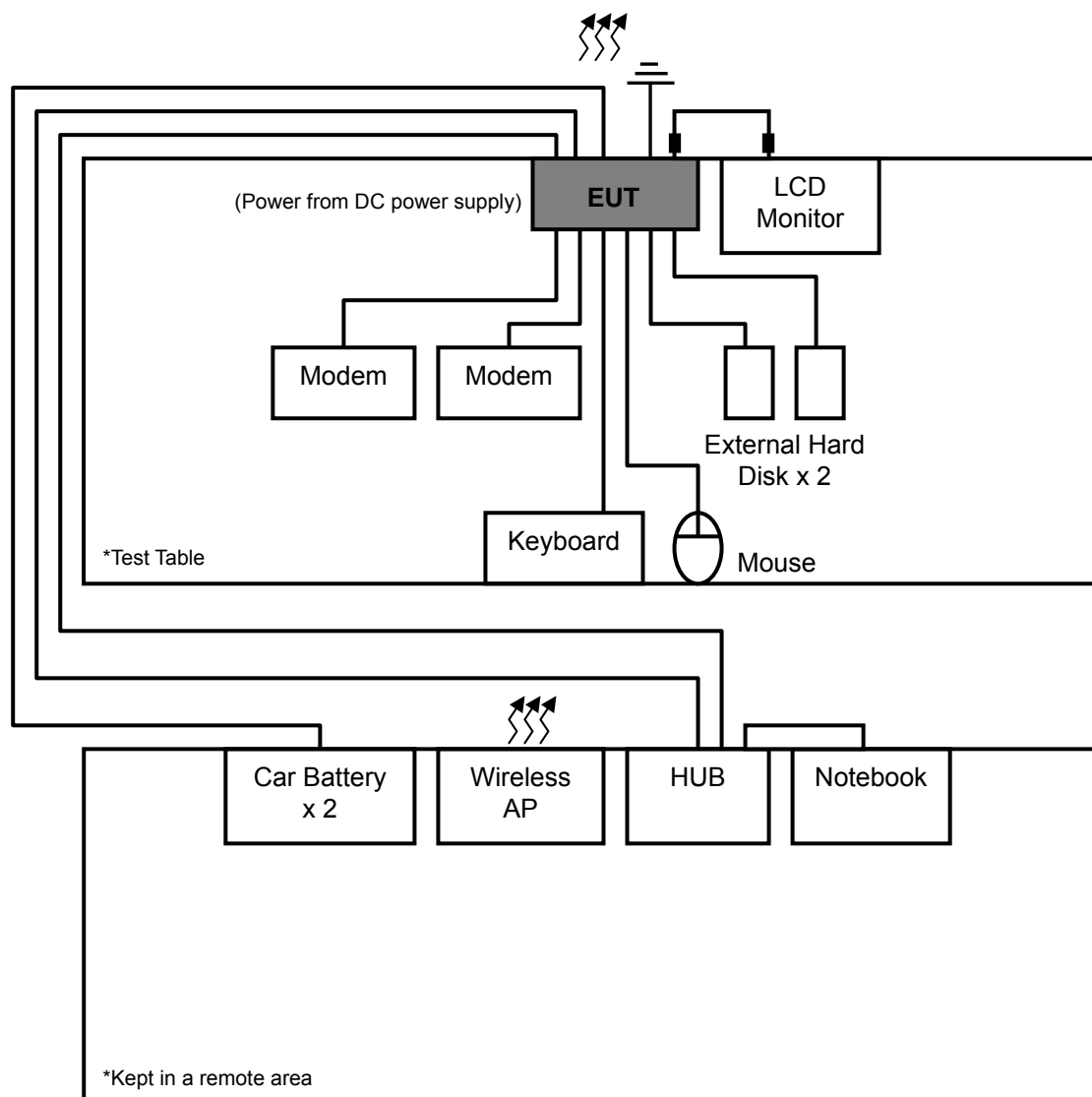
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	LCD MONITOR	DELL	2407WFPb	CN-0FC255-46633-665-07US	FCC DoC Approved
2	MODEM	ACEEX	1414V/3	0401008256	IFAXDM1414
3	MODEM	ACEEX	1414V/3	0401008250	IFAXDM1414
4	KEYBOARD	DELL	RT7D20	CN-04N454-37172-3BM-B213	AQ6-7D20
5	MOUSE	DELL	M071KC	504009063	FCC DoC Approved
6	EXTERNAL HARD DISK	Sarotech	FHD-354UA	E80L229180019	NA
7	EXTERNAL HARD DISK	Sarotech	FHD-354UA	E80L229180007	NA
8	EXTERNAL HARD DISK	Terasys	F12-U	A0100214-63f0013	NA
9	EXTERNAL HARD DISK	Terasys	F12-U	A0100214-63f0005	NA
10	CAR BATTERY	YUASA	46B24R(S)	NA	NA
11	CAR BATTERY	YUASA	46B24R(S)	NA	NA
12	NOTEBOOK	DELL	PP05L	27368374672	E2K24CLNS
13	HUB	ZyXEL	GS-108B	S090H39011213	NA
14	WIRELESS AP	BUFFALO	WBR2-G54	34059544811648	FDI-04600142-0

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	1.8m braid shielded wire, D-SUB connector, with two cores.
2	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.
3	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.
4	2m foil shielded wire, PS/2 Connector, w/o core.
5	2m foil shielded wire, PS/2 Connector, w/o core.
6	1.8m shielded cable, terminated with USB connector, w/o core.
7	1.8m shielded cable, terminated with USB connector, w/o core.
8	1.5m shielded cable, terminated with USB connector, w/o core.
9	1.5m shielded cable, terminated with USB connector, w/o core.
10	NA
11	NA
12	3m RJ45 UTP cable.
13	3m RJ45 UTP cable x 2.
14	NA

NOTE:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item 8~9 were for ESD & EFT test only and Item 6~7 for other immunity tests.
3. Item 10~14 acted as a communication partners to transfer data.

TEST CONFIGURATION



4 EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT FOR AUXILIARY A.C. OR D.C. POWER PORTS

4.1.1 LIMITS FOR AUXILIARY A.C. OR D.C. POWER PORTS

TEST STANDARD: EN 50121-3-2

PORT	TEST SPECIFICATION		BASIC STANDARD	REMARKS
			TEST SET-UP	
Auxiliary supply sinusoidal a.c. or d.c.	9 kHz ~ 150 kHz	No limits	EN 55011	See NOTE 1 & 2
	150 kHz ~ 500 kHz	99 dB μ V quasi-peak		See NOTE 3, 4 & 5
	500 kHz ~ 30 MHz	93 dB μ V quasi-peak		See NOTE 3, 4 & 5

NOTE

- At present there are no limits for conducted emissions from 9 kHz to 150 kHz. Limiting conducted emissions from an apparatus will prevent excessive radiated emissions. Experience in this technique and the relationship between conducted and radiated emissions is necessary in order to progress this standard in the future.
- 230 Vac power outlet ports for public use shall offer a power quality, which is sufficient for the use of intended equipment like PC and mobile telephone chargers. The harmonic distortion in differential and common mode shall be limited by a sine-filter to < 5 %. The burst and surge emissions of the outlet have to be limited to the levels of residential equipment according to EN 61000-6-1. AM radio receivers are not intended to be supplied by these power outlets.
- Wherever applicable the method defined by EN 55011 is to be used. At present the existing method of measuring conducted emissions (EN 55011) has limitations in terms of voltage and current rating of coupling networks. In addition the method of measuring voltage has safety implications for testing high power systems. Limiting conducted emissions from apparatus connected to external cable systems will prevent excessive radiated emissions.
- This requirement refers to the industrial limit values but considering they have been defined to protect radio and TV sets and as the objective is not the same here, the applicable limit for railway applications have been relaxed by 20 dB to be more representative of potential problems.
- This requirement is not applicable to power ports which are connected to other dedicated, compatible ports.

4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Nov. 23, 2010	Nov. 22, 2011
RF signal cable Woken	5D-FB	Cable-HYCO2-01	Dec. 30, 2010	Dec. 29, 2011
LISN ROHDE & SCHWARZ	ESH2-Z5	100100	Jan. 06, 2011	Jan. 05, 2012
LISN ROHDE & SCHWARZ	ESH3-Z5	100311	Jul. 08, 2010	Jul. 07, 2011
V-LISN SCHWARZBECK	NNBL 8226-2	8226-142	Jul. 12, 2010	Jul. 11, 2011
Software ADT	ADT_Cond_ V7.3.7	NA	NA	NA

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Shielded Room 2.
 3. The VCCI Site Registration No. is C-2047.

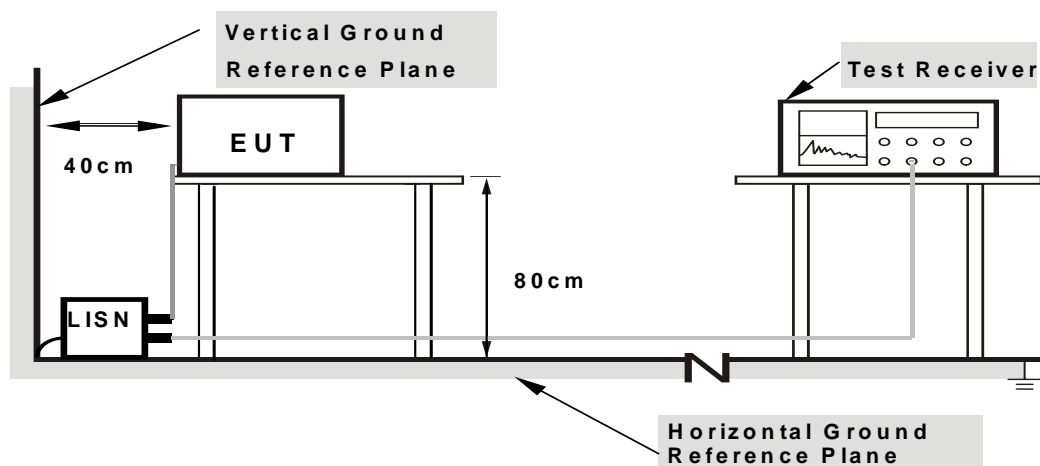
4.1.3 TEST PROCEDURE

- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20dB) were not recorded.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.1.6 EUT OPERATING CONDITIONS

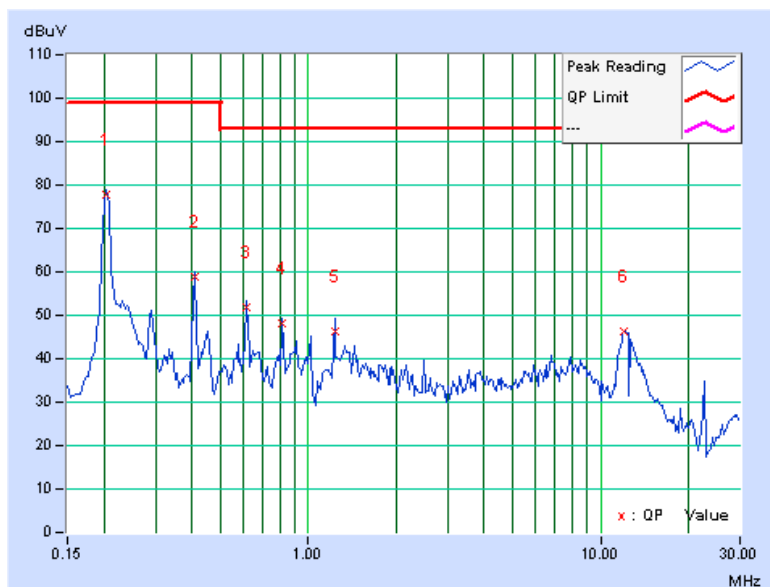
- The EUT ran BurnIn 6.0 test program to enable all functions.
- The EUT sent “H” patterns to its screen and its screen displayed “H” patterns.
- The EUT sent “H” patterns to the modems.
- The EUT communicated messages with the external HDDs.
- The EUT linked with the notebooks, which acted as a communication partners.
- Step b ~ c were repeated.
- The communication partner sent data to EUT by command "PING".

4.1.7 TEST RESULTS

INPUT POWER	24Vdc	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	23 deg. C, 65% RH, 1017 hPa	PHASE	Line 1
TESTED BY	Peter Lin		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]	Emission Level [dB (uV)]	Limit [dB (uV)]	Margin (dB)
			Q.P.	Q.P.	Q.P.	Q.P.
1	0.205	0.21	77.68	77.89	99.00	-21.11
2	0.408	0.23	58.69	58.92	99.00	-40.08
3	0.615	0.25	51.68	51.93	93.00	-41.07
4	0.818	0.26	47.80	48.06	93.00	-44.94
5	1.230	0.30	45.89	46.19	93.00	-46.81
6	12.074	0.42	45.98	46.40	93.00	-46.60

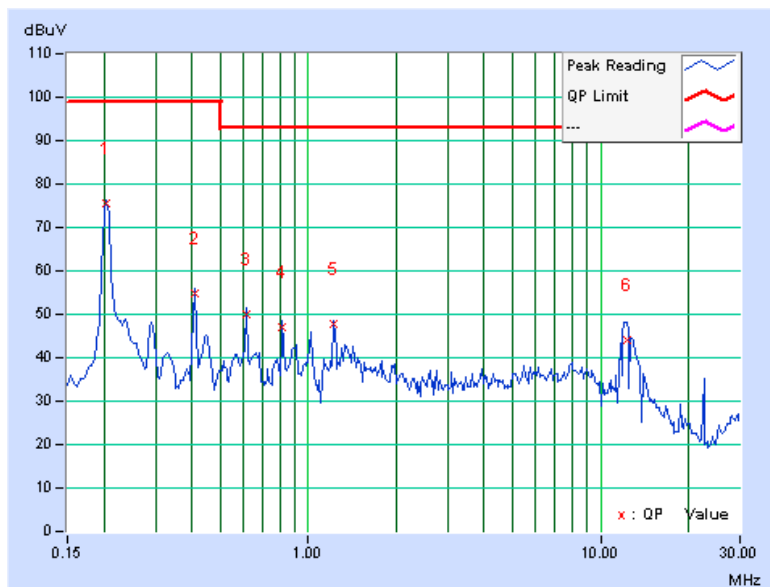
REMARKS: 1. The emission levels of other frequencies were very low against the limit.
 2. Margin value = Emission level - Limit value
 3. Correction factor = Insertion loss + Cable loss
 4. Emission Level = Correction Factor + Reading Value.



INPUT POWER	24Vdc	6dB BANDWIDTH	9 kHz
ENVIRONMENTAL CONDITIONS	23 deg. C, 65% RH, 1017 hPa	PHASE	Line 2
TESTED BY	Peter Lin		

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]	Emission Level [dB (uV)]	Limit [dB (uV)]	Margin (dB)
			Q.P.	Q.P.	Q.P.	Q.P.
1	0.205	0.16	75.43	75.59	99.00	-23.41
2	0.408	0.18	54.71	54.89	99.00	-44.11
3	0.615	0.20	49.98	50.18	93.00	-42.82
4	0.818	0.22	46.64	46.86	93.00	-46.14
5	1.227	0.26	47.39	47.65	93.00	-45.35
6	12.281	0.46	43.74	44.20	93.00	-48.80

REMARKS: 1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission level - Limit value
3. Correction factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value.



4.2 RADIATED EMISSION MEASUREMENT FOR ENCLOUSE PORT

4.2.1 LIMITS OF ENCLOUSE PORT

TEST STANDARD: EN 50121-3-2

PORT	TEST SPECIFICATION		BASIC STANDARD	REMARKS
			TEST SET-UP	
Enclosure	30 MHz ~ 230 MHz	40 dB μ V/m quasi-peak	EN 55011	See NOTE 1 & 2
	230 MHz ~ 1 GHz	47 dB μ V/m quasi-peak		See NOTE 1 & 2

NOTE

1. Measurement distance is 10 m. A measurement distance of 3 m may be used with the limit increased by 10 dB.
2. Traction converters and auxiliary converters over 50 kVA need not be tested individually but when the vehicle is tested as a whole in accordance with EN 50121-3-1.

4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESIB7	100186	Nov. 29, 2010	Nov. 28, 2011
Test Receiver ROHDE & SCHWARZ	ESIB7	100212	Jul. 22, 2010	Jul. 21, 2011
Spectrum Analyzer Agilent	E4446A	MY48250266	Aug. 11, 2010	Aug. 10, 2011
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Apr. 27, 2010	Apr. 26, 2011
BILOG Antenna SCHWARZBECK	VULB9168	9168-149	Apr. 27, 2010	Apr. 26, 2011
HORN Antenna EMCO	3115	5623	Jul. 13, 2010	Jul. 12, 2011
Preamplifier Agilent	8447D	2944A10636	Dec. 02, 2010	Dec. 01, 2011
Preamplifier Agilent	8447D	2944A10637	Dec. 02, 2010	Dec. 01, 2011
Preamplifier Agilent	8449B	3008A01959	Nov. 03, 2010	Nov. 02, 2011
RF signal cable Woken	8D-FB	Cable-Hych1-01	Nov. 06, 2010	Nov. 05, 2011
RF signal cable Woken	8D-FB	Cable-Hych1-02	Nov. 06, 2010	Nov. 05, 2011
Software ADT	ADT_Radiated_ V 7.7.03.6	NA	NA	NA
Antenna Tower(V)	MFA-440	9707	NA	NA
Antenna Tower(H)	MFA-440	970705	NA	NA
Turn Table	DS430	50303	NA	NA
Controller	MF7802	074	NA	NA
Controller	MF7802	08093	NA	NA
RF signal cable EAST COST Microwave	HP 160S-29	NA	Feb. 12, 2010	Feb. 11, 2011

- NOTE:** 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in HwaYa Chamber 1.
3. The FCC Site Registration No. is 477732.
4. The IC Site Registration No. is IC 7450F-1.
5. The VCCI Site Registration No. is R-1893.

4.2.3 TEST PROCEDURE

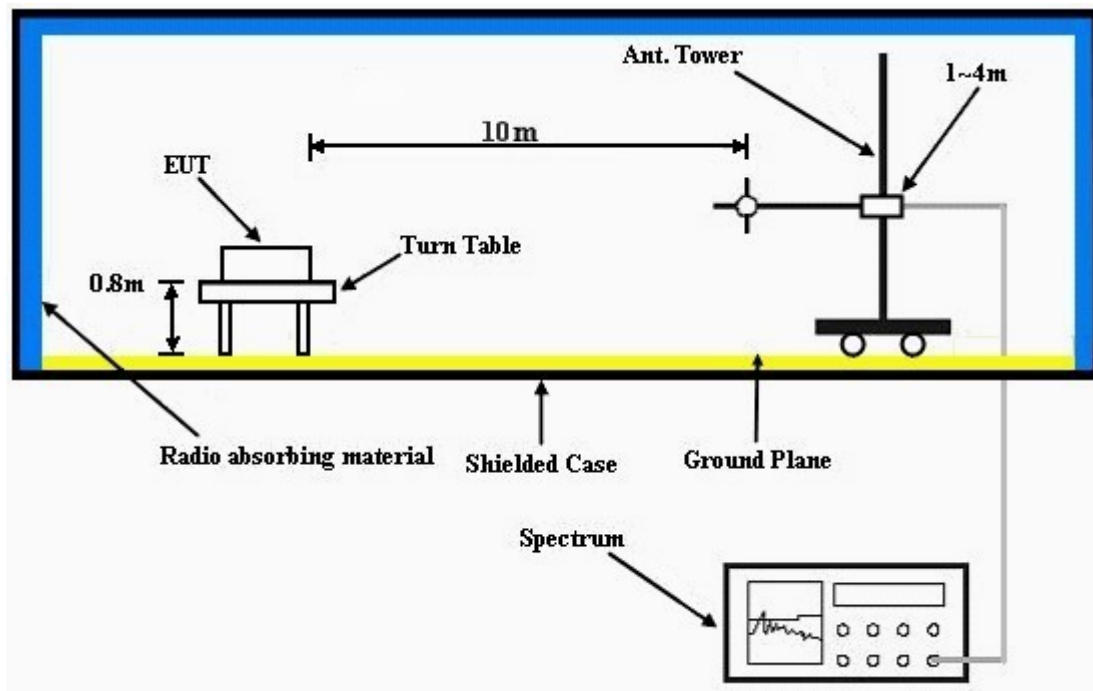
- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

NOTE: The resolution bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

4.2.6 EUT OPERATING CONDITIONS

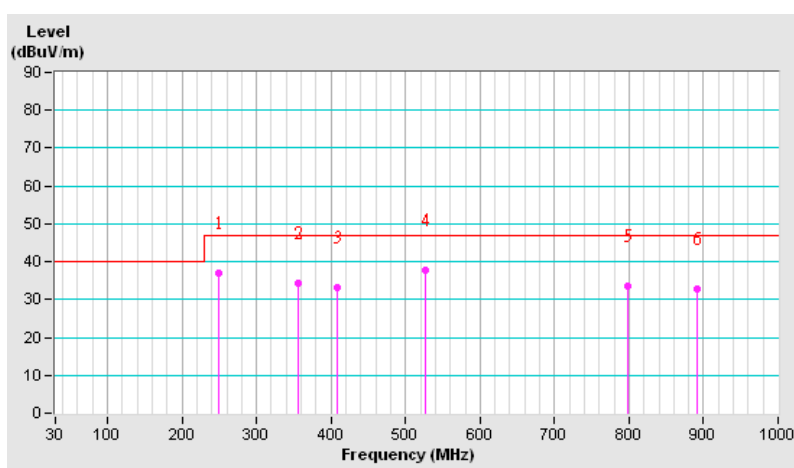
Same as 4.1.6.

4.2.7 TEST RESULTS

INPUT POWER	24Vdc	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	24 deg. C, 62% RH, 1019 hPa	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Felix Chen		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 10 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	249.66	36.91 QP	47.00	-10.09	3.50 H	97	23.72	13.20
2	356.57	34.34 QP	47.00	-12.66	2.50 H	1	17.82	16.52
3	409.06	33.12 QP	47.00	-13.88	2.00 H	23	15.17	17.95
4	525.69	37.80 QP	47.00	-9.20	1.50 H	23	17.21	20.58
5	797.84	33.45 QP	47.00	-13.55	1.00 H	186	7.83	25.62
6	891.14	32.62 QP	47.00	-14.38	1.00 H	241	5.51	27.11

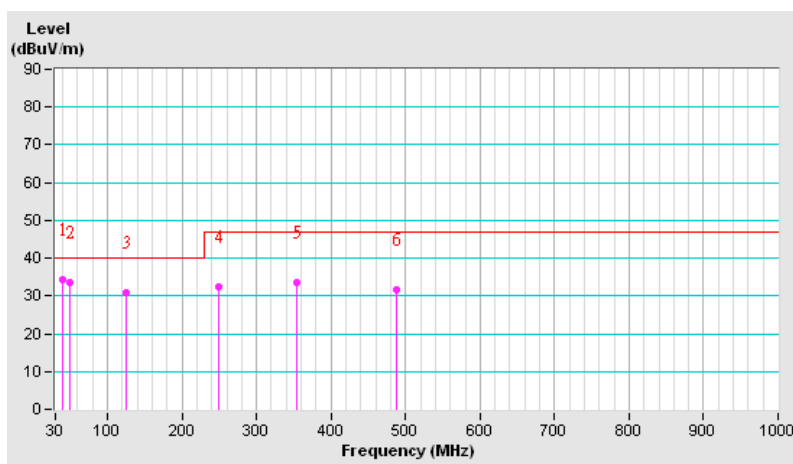
- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



INPUT POWER	24Vdc	FREQUENCY RANGE	30-1000 MHz
ENVIRONMENTAL CONDITIONS	24 deg. C, 62% RH, 1019 hPa	DETECTOR FUNCTION & BANDWIDTH	Quasi-Peak, 120 kHz
TESTED BY	Felix Chen		

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 10 M								
No.	Freq. (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	39.72	34.18 QP	40.00	-5.82	1.00 V	342	19.66	14.52
2	49.44	33.58 QP	40.00	-6.42	1.00 V	79	19.46	14.12
3	125.25	30.72 QP	40.00	-9.28	1.00 V	358	17.84	12.88
4	249.66	32.43 QP	47.00	-14.57	1.50 V	137	18.56	13.86
5	354.63	33.47 QP	47.00	-13.53	1.00 V	342	16.30	17.17
6	488.76	31.52 QP	47.00	-15.48	3.50 V	1	10.93	20.59

- REMARKS:**
1. Emission level(dBuV/m)=Raw Value(dBuV) + Correction Factor(dB/m)
 2. Correction Factor(dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level – Limit value.



5 IMMUNITY TEST

5.1 GENERAL DESCRIPTION

Product Standard:	EN 50121-3-2	
Basic Standard, Specification, and Performance Criteria:	EN 61000-4-2	Electrostatic Discharge – ESD: ±8kV air discharge, ±6kV Contact discharge, Performance Criterion B
	EN 61000-4-3	Radio-Frequency Electromagnetic Field Susceptibility Test – RS: 80-1000 MHz, 20V/m, 80% AM (1kHz), ¹ 800-1000 MHz, 20V/m, 80% AM (1kHz), 1400-2100 MHz, 10V/m, 80% AM (1kHz), 2100-2500 MHz, 5V/m, 80% AM (1kHz), Performance Criterion A
	EN 61000-4-4	Electrical Fast Transient/Burst - EFT ±2kV, (5/50 ns, 5kHz) Performance Criterion A
	EN 61000-4-5	Surge Immunity Test: 1.2/50 μ s open circuit voltage, 42 Ω , 0.5 μ F line to line ±1 kV, line to ground ±2kV Performance Criterion B
	EN 61000-4-6	Conducted Radio Frequency Disturbances Test – CS: 0.15-80 MHz, 10Vrms, 80% AM, 1kHz, Performance Criterion A

NOTE¹: This limit applies to equipment mounted in the passenger compartments, drivers cab or external to the rolling stock (roof, underframe). For equipment mounted in all other areas a severity level of 10 V/m may be used

5.2 GENERAL PERFORMANCE CRITERIA DESCRIPTION

According to EN 50121-1 standard, the following describes the general performance criteria:

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be provided by the manufacturer and noted in the test report, based on the following criteria:

CRITERION A	The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
CRITERION B	The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer, either of these may be derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
CRITERION C	Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls.

5.3 EUT OPERATING CONDITION

- The EUT ran BurnIn 6.0 test program to enable all functions.
- The EUT sent "H" patterns to its screen and its screen displayed "H" patterns.
- The EUT sent "H" patterns to the modems.
- The EUT communicated messages with the external HDDs.
- The EUT linked with the notebook, HUB and wireless AP, which acted as a communication partners.
- Step b ~ c were repeated.
- The communication partner sent data to EUT by command "PING".
- The touch screen and monitor display functions were evaluated during and after test.

5.4 ELECTROSTATIC DISCHARGE IMMUNITY TEST (ESD)

5.4.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-2
Discharge Impedance:	330 ohm / 150 pF
Discharge Voltage:	Air Discharge: 2, 4, 8 kV (Direct) Contact Discharge: 2, 4, 6 kV (Direct / Indirect)
Polarity:	Positive & Negative
Number of Discharge:	Minimum 20 times at each test point
Discharge Mode:	Single Discharge
Discharge Period:	1 second minimum

5.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Electronic Discharge Simulator (KeyTek)	MZ-151EC	0310225	May 26, 2010	May 25, 2011

NOTE: 1. The test was performed in Hwa Ya ESD Room No. 1.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

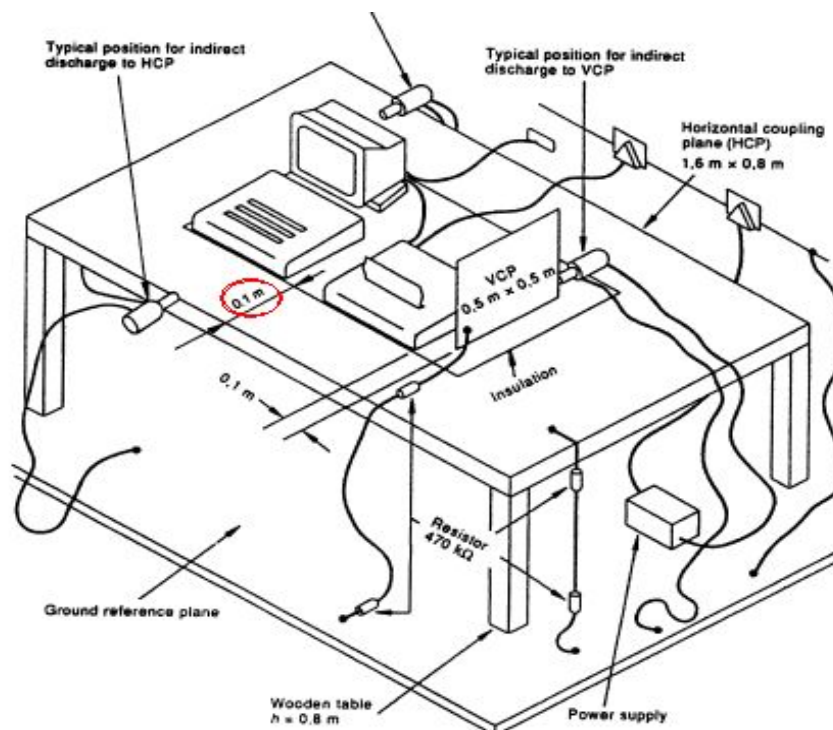
5.4.3 TEST PROCEDURE

- a. Electrostatic discharges were applied only to those points and surfaces of the EUT that are accessible to users during normal operation.
- b. The test was performed with at least ten single discharges on the pre-selected points in the most sensitive polarity.
- c. The time interval between two successive single discharges was at least 1 second.
- d. The ESD generator was held perpendicularly to the surface to which the discharge was applied and the return cable was at least 0.2 meters from the EUT.
- e. Contact discharges were applied to the non-insulating coating, with the pointed tip of the generator penetrating the coating and contacting the conducting substrate.
- f. Air discharges were applied with the round discharge tip of the discharge electrode approaching the EUT as fast as possible (without causing mechanical damage) to touch the EUT. After each discharge, the ESD generator was removed from the EUT and re-triggered for a new single discharge. The test was repeated until all discharges were complete.
- g. At least ten single discharges (in the most sensitive polarity) were applied to the **Horizontal Coupling Plane** at points on each side of the EUT. The ESD generator was positioned horizontally at a distance of 0.1 meters from the EUT with the discharge electrode touching the **HCP**.
- h. At least ten single discharges (in the most sensitive polarity) were applied to the center of one vertical edge of the **Vertical Coupling Plane** in sufficiently different positions that the four faces of the EUT were completely illuminated. The **VCP** (dimensions 0.5m x 0.5m) was placed vertically to and 0.1 meters from the EUT.

5.4.4 DEVIATION FROM TEST STANDARD

No deviation.

5.4.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLE-TOP EQUIPMENT

The configuration consisted of a wooden table 0.8 meters high standing on the **Ground Reference Plane**. The **GRP** consisted of a sheet of aluminum at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system. A **Horizontal Coupling Plane** (1.6m x 0.8m) was placed on the table and attached to the **GRP** by means of a cable with 940kΩ total impedance. The equipment under test, was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were placed on the **HCP** and isolated by an insulating support of 0.5mm thickness. A distance of 1-meter minimum was provided between the EUT and the walls of the laboratory and any other metallic structure.

FLOOR-STANDING EQUIPMENT

The equipment under test was installed in a representative system as described in section 7 of EN 61000-4-2, and its cables were isolated from the Ground Reference Plane by an insulating support of 0.1-meter thickness. The GRP consisted of a sheet of aluminum that is at least 0.25mm thick, and 2.5 meters square connected to the protective grounding system and extended at least 0.5 meters from the EUT on all sides.

5.4.6 TEST RESULTS

INPUT POWER	24Vdc	ENVIRONMENTAL CONDITIONS	26 deg. C, 50% RH, 1014hPa
TESTED BY	Andy Chang		

TEST RESULTS OF DIRECT APPLICATION					
Discharge Level (kV)	Polarity	Test Point	Contact Discharge	Air Discharge	Performance Criterion
2	+/-	1 ~ 6	NOTE 1	NA	A
4, 6	+/-	1 ~ 6	NOTE 2	NA	B
2, 4, 8	+/-	7 ~ 10	NA	NOTE 1	A
2, 4	+/-	11	NA	NOTE 2	B
8	+/-	11	NA	NOTE 2	B

Description of test point: Please refer to following photos for representative mark only.

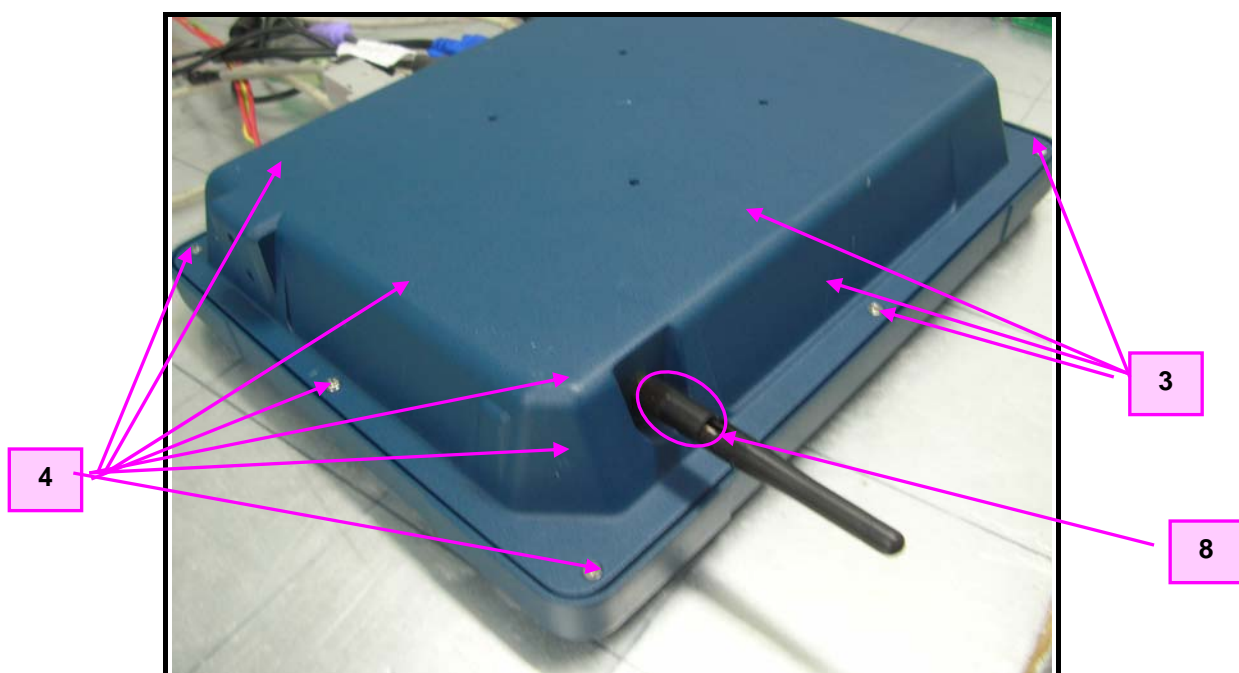
TEST RESULTS OF INDIRECT APPLICATION					
Discharge Level (kV)	Polarity	Test Point	Horizontal Coupling Plane	Vertical Coupling Plane	Performance Criterion
2, 4, 6	+/-	4 sides	NOTE 1	NOTE 1	A

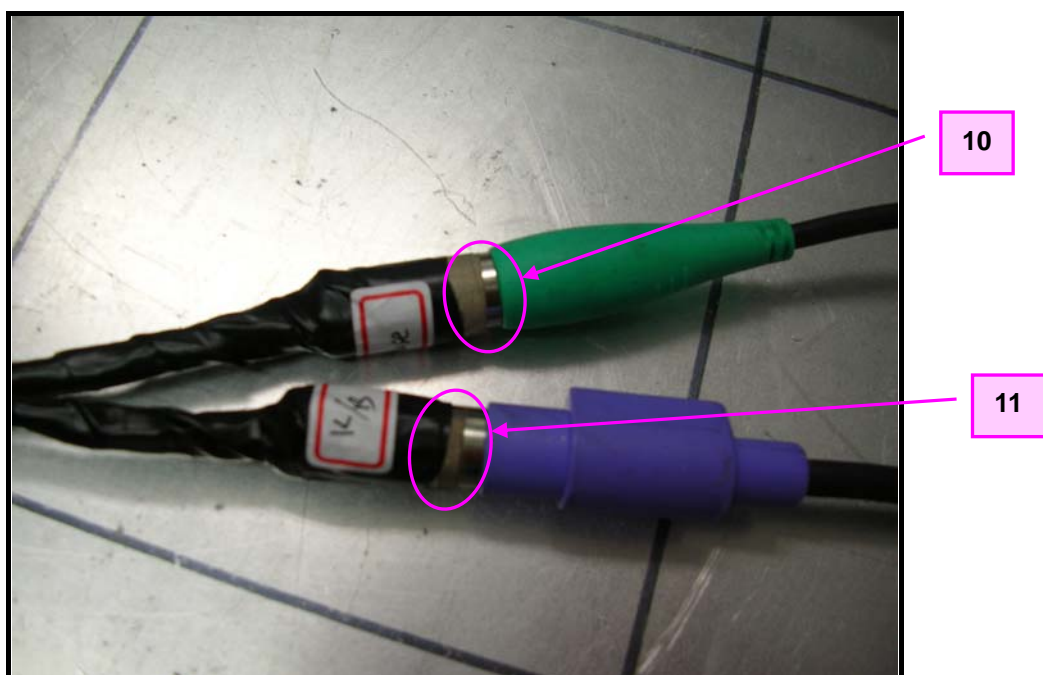
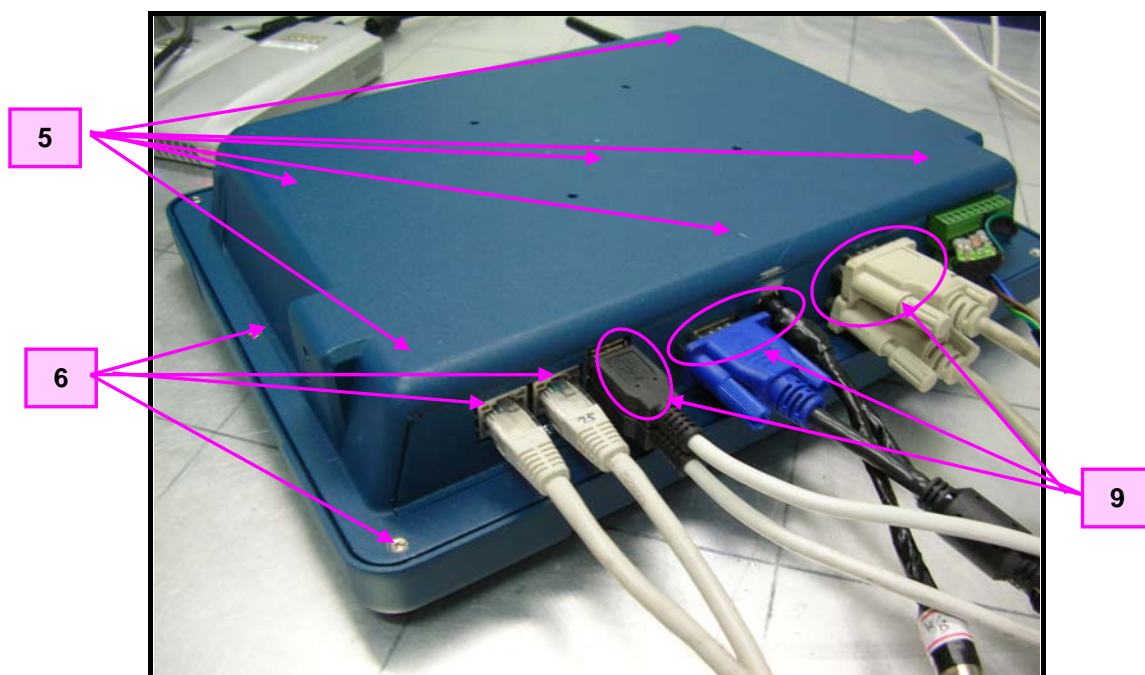
Description of test point:

1. Front side 2. Rear side 3. Right side 4. Left side

NOTE:

1. There was no change compared with the initial operation during the test.
2. The LAN & WAN connection of EUT broke off during the test, but could self-recover to the initial operation after the test.
3. The touch screen and monitor display functions were evaluated during and after test.





5.5 RADIATED, RADIO-FREQUENCY, ELECTROMAGNETIC FIELD IMMUNITY TEST (RS)

5.5.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-3
Frequency Range:	80~1000 MHz 800~1000 MHz 1400~2100 MHz 2100~2500 MHz
Field Strength:	5, 10, 20 V/m
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Polarity of Antenna:	Horizontal and Vertical
Antenna Height:	1.5 m
Dwell Time:	3 seconds

5.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Boonton RF Power Meter	4232A-01-02	107402	Apr. 27, 2010	Apr. 26, 2011
R&S Signal Generator	SML03	101499	Nov. 23, 2010	Nov. 22, 2011
LOG ANTENNA	AT5080ANT	303730	NA	NA
Amplifier	60S1G3M1	308049	NA	NA
Amplifier RF TEST SYSCTRLR	SC1000M1	308057	NA	NA
Amplifier	150W1000	322011	NA	NA
Amplifier	DC7144A	307880	NA	NA
POWER SENSOR	51011-EMC	33105	Apr. 27, 2010	Apr. 26, 2011
POWER SENSOR	51011-EMC	33107	Apr. 27, 2010	Apr. 26, 2011
Software	ADT_RS_V450	NA	NA	NA

- NOTE:**
1. The test was performed in Hwa Ya RS Room 1.
 2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 3. The transmit antenna was located at a distance of 2.0 meters from the EUT. (For frequency range 80MHz ~ 1GHz).
 4. The transmit antenna was located at a distance of 1.5 meters from the EUT. (For frequency range 1GHz ~ 3GHz).

5.5.3 TEST PROCEDURE

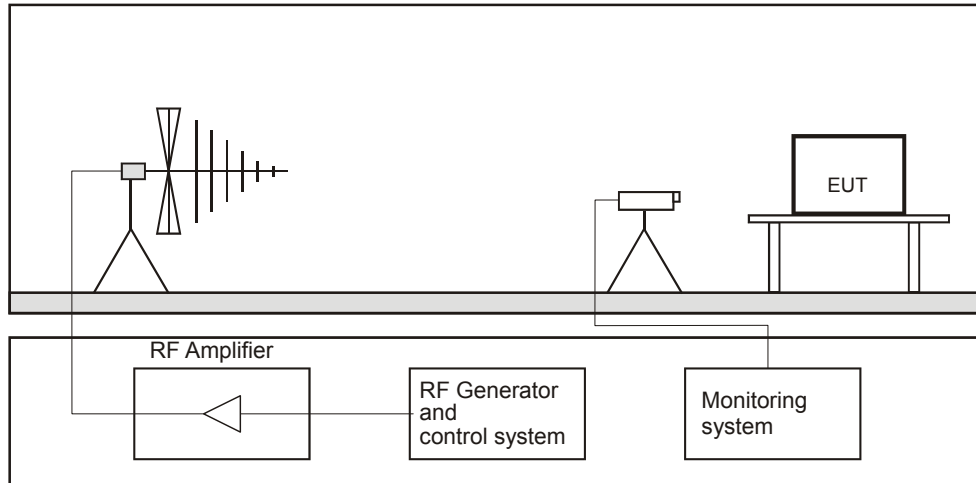
The test procedure was in accordance with IEC 61000-4-3

- a. The testing was performed in a fully-anechoic chamber.
- b. The frequency range is swept from 80 MHz to 1000 MHz, 1400 MHz to 2100 MHz, 2100 MHz to 2500 MHz with the signal 80% amplitude modulated with a 1kHz sine wave.
- c. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised and to respond, but shall in no case be less than 0,5s.
- d. The field strength level was up to 5, 10, 20 V/m.
- e. The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.

5.5.4 DEVIATION FROM TEST STANDARD

No deviation.

5.5.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

TABLETOP EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive table 0.8 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

FLOOR STANDING EQUIPMENT

The EUT installed in a representative system as described in section 7 of EN 61000-4-3 was placed on a non-conductive wood support 0.1 meters in height. The system under test was connected to the power and signal wire according to relevant installation instructions.

5.5.6 TEST RESULTS

INPUT POWER	24Vdc	ENVIRONMENTAL CONDITIONS	27 deg. C, 56% RH, 1008 hPa
TESTED BY	Nick Liu		

Frequency (MHz)	Polarity	Azimuth	Field Strength (V/m)	Observation	Performance Criterion
80-1000	V&H	0, 90, 180, 270	20	NOTE	A
800-1000	V&H	0, 90, 180, 270	20	NOTE	A
1400-2100	V&H	0, 90, 180, 270	10	NOTE	A
2100-2500	V&H	0, 90, 180, 270	5	NOTE	A

* The exclusion band for the transmitter and / or receiver part of the 2.45 GHz RLAN equipment under test shall extend from 2280 MHz to 2607.675 MHz.

NOTE:

1. There was no change compared with the initial operation during the test.
2. The touch screen and monitor display functions were evaluated during and after test.

5.6 ELECTRICAL FAST TRANSIENT/BURST IMMUNITY TEST (EFT)

5.6.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-4
Test Voltage:	Power input ports: 2 kV Signal/Control ports : 2 kV
Polarity:	Positive & Negative
Impulse Frequency:	5 kHz
Impulse Waveshape :	5/50 ns
Burst Duration:	15 ms
Burst Period:	300 ms
Test Duration:	Not less than 1 min.

5.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
EMC-Partner EFT Generator	TRA2000EFT-C1	623	Apr. 30, 2010	Apr. 29, 2011
EMC-Partner Capacitive Coupling clamp	CN-EFT1000	364	NA	NA
EFT Adapter WONPRO	WA	EF1Ada-001	NA	NA
Software	EMC-Partner GENECS	NA	NA	NA

NOTE: 1. The test was performed in Hwa Ya EFT Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

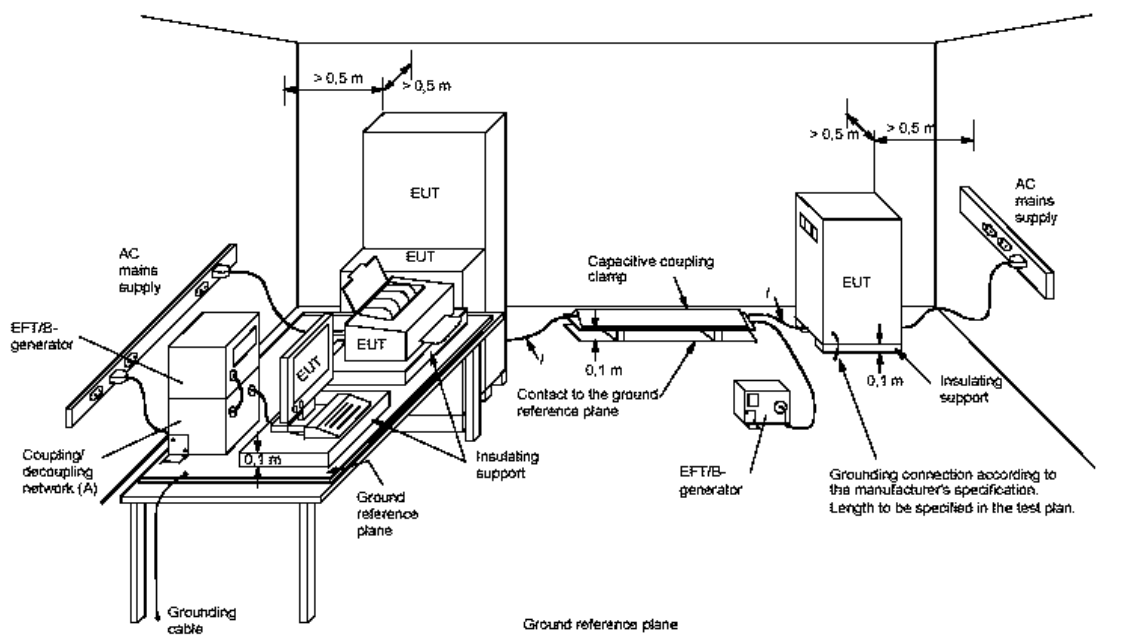
5.6.3 TEST PROCEDURE

- Both positive and negative polarity discharges were applied.
- The length of the "hot wire" from the coaxial output of the EFT generator to the terminals on the EUT was 0.5 meter.
- The duration time of each test sequential was 1 minute.
- The transient/burst waveform was in accordance with EN 61000-4-4, 5/50ns.

5.6.4 DEVIATION FROM TEST STANDARD

No deviation.

5.6.5 TEST SETUP



NOTE:

/ length between clamp and the EUT to be tested (should be $0.5 \pm 0.05\text{m}$)

(A) location for supply line coupling

(B) location for signal lines coupling

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

NOTE:

EUTs, whether stationary floor-mounted or table top, and equipment designed to be mounted in other configurations, shall be placed on a ground reference plane and shall be insulated from it by an insulating support $0,1\text{ m} \pm 0,01\text{ m}$ thick. A minimum distance of 0.5m was provided between the EUT and the walls of the laboratory or any other metallic structure.

5.6.6 TEST RESULTS

INPUT POWER	24Vdc	ENVIRONMENTAL CONDITIONS	23 deg. C, 50% RH, 1014 hPa
TESTED BY	Andy Chang		

Test Point	Polarity	Test Level (kV)	Observation	Performance Criterion
DC power (+)	+/-	2	NOTE	A
DC power (-)	+/-	2	NOTE	A
PE	+/-	2	NOTE	A
DC power (+) – DC power (-) – PE	+/-	2	NOTE	A
LAN 1 (RJ45)	+/-	2	NOTE	A
LAN 2 (RJ45)	+/-	2	NOTE	A
RS232	+/-	2	NOTE	A
VGA	+/-	2	NOTE	A

NOTE:

1. There was no change compared with initial operation during and after the test.
2. The touch screen and monitor display functions were evaluated during and after test.

5.7 SURGE IMMUNITY TEST

5.7.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-5
Wave-Shape:	Combination Wave 1.2/50 us Open Circuit Voltage 8 /20 us Short Circuit Current
Test Voltage:	Power Line : 0.5, 1 kV
Surge Input/Output:	L1-L2, L1-PE, L2-PE
Generator Source Impedance:	2 ohm between networks 12 ohm between network and ground
Polarity:	Positive/Negative
Phase Angle:	0°/90°/180°/270°
Pulse Repetition Rate:	60 sec.
Number of Tests:	5 positive and 5 negative at selected points

5.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Modular Impulse Generator EMC-Partner Modular	MIG0603IN3	352	Aug. 30, 2010	Aug. 29, 2011
EMC-Partner	CDN UTP8	011	Aug. 30, 2010	Aug. 29, 2011
Surge Adapter WONPRO	WA	SU1 Ada-001	NA	NA

- NOTE:** 1. The test was performed in Hwa Ya Surge Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

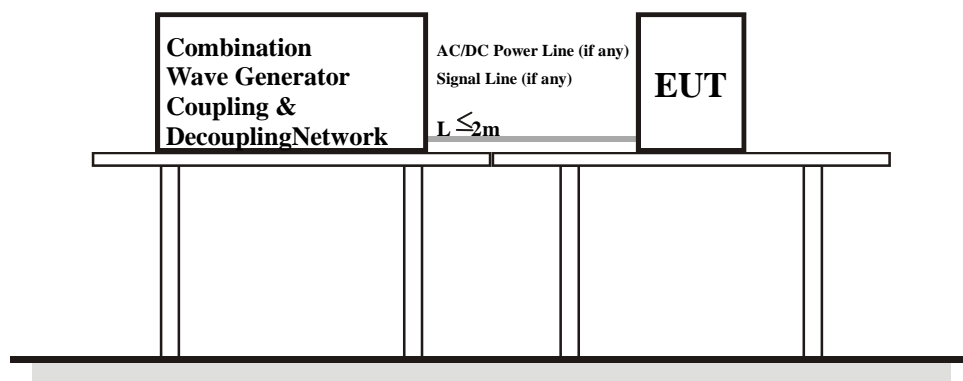
5.7.3 TEST PROCEDURE

- a. For EUT power supply:
The surge is to be applied to the EUT power supply terminals via the capacitive coupling network. Decoupling networks are required in order to avoid possible adverse effects on equipment not under test that may be powered by the same lines, and to provide sufficient decoupling impedance to the surge wave. The power cord between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).
- b. For test applied to unshielded unsymmetrically operated interconnection lines of EUT:
The surge is applied to the lines via the capacitive coupling. The coupling / decoupling networks shall not influence the specified functional conditions of the EUT. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).
- c. For test applied to unshielded symmetrically operated interconnection / telecommunication lines of EUT:
The surge is applied to the lines via gas arrestors coupling. Test levels below the ignition point of the coupling arrestor cannot be specified. The interconnection line between the EUT and the coupling/decoupling networks shall be 2 meters in length (or shorter).

5.7.4 DEVIATION FROM TEST STANDARD

No deviation.

5.7.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

5.7.6 TEST RESULTS

INPUT POWER	24Vdc	ENVIRONMENTAL CONDITIONS	24 deg. C, 50% RH, 1016 hPa
TESTED BY	Andy Chang		

DC POWER PORT

Voltage (kV)	Test Point	Polarity	Phase Angle				Performance Criterion
			0°	90°	180°	270°	
0.5	DC power (+) – DC power (-)	+/-	NOTE	NOTE	NOTE	NOTE	A
0.5, 1	DC power (+) – PE	+/-	NOTE	NOTE	NOTE	NOTE	A
0.5, 1	DC power (-) – PE	+/-	NOTE	NOTE	NOTE	NOTE	A

NOTE:

1. There was no change compared with initial operation during and after the test.
2. The touch screen and monitor display functions were evaluated during and after test.

5.8 IMMUNITY TO CONDUCTED DISTURBANCES INDUCED BY RF FIELDS (CS)

5.8.1 TEST SPECIFICATION

Basic Standard:	EN 61000-4-6
Frequency Range:	0.15 MHz - 80 MHz
Field Strength:	10 V _{r.m.s.}
Modulation:	1 kHz Sine Wave, 80%, AM Modulation
Frequency Step:	1 % of fundamental
Coupled Cable:	Power Mains, Unshielded
Coupling Device:	CDN-M3 (3 wires), Clamp

5.8.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
FCC POWER LINE COUPLING DECOUPLING NETWORK	M/N:FCC-801-M1-25A	03030	Nov. 09, 2010	Nov. 08, 2011
FCC POWER LINE COUPLING DECOUPLING NETWORK	M/N:FCC-801-M2-25A	03049	Nov. 09, 2010	Nov. 08, 2011
FCC POWER LINE COUPLING DECOUPLING NETWORK	M/N:FCC-801-M2-25A	03050	Nov. 09, 2010	Nov. 08, 2011
FCC POWER LINE COUPLING DECOUPLING NETWORK	M/N:FCC-801-M3-25A	03056	Nov. 09, 2010	Nov. 08, 2011
FCC POWER LINE COUPLING DECOUPLING NETWORK	M/N:FCC-801-M3-25A	03057	Nov. 09, 2010	Nov. 08, 2011
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	P/N:FCC-801-T2	03030	Nov. 09, 2010	Nov. 08, 2011
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	P/N:FCC-801-T4	03031	Nov. 09, 2010	Nov. 08, 2011
FCC SIGNAL LINE POWER LINE COUPLING DECOUPLING NETWORK	P/N:FCC-801-T8	03032	Nov. 09, 2010	Nov. 08, 2011
EMI Injection Clamp	P/N:F-203I-23MM	434	Nov. 09, 2010	Nov. 08, 2011
Amplifier Research Power Amplifier	75A250AM2	307804	N/A	N/A
BOONTON 4232ARF POWER METER	4232A-01-02	104302	Nov. 12, 2010	Nov. 11, 2011
R&S Signal generator	SML01	102148	Nov. 09, 2010	Nov. 08, 2011
Software	ADT_CS_V37	NA	NA	NA
POWER SENSOR	51011-EMC	30028	Nov. 13, 2010	Nov. 12, 2011
POWER SENSOR	51011-EMC	33029	Nov. 12, 2010	Nov. 11, 2011

NOTE: 1. The test was performed in Hwa Ya CS Room.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

5.8.3 TEST PROCEDURE

- a. The EUT shall be tested within its intended operating and climatic conditions.
- b. The test shall be performed with the test generator connected to each of the coupling and decoupling devices in turn, while the other non-excited RF input ports of the coupling devices are terminated by a 50-ohm load resistor.
- c. The frequency range is swept from 150 kHz to 80 MHz, using the signal level established during the setting process and with a disturbance signal of 80 % amplitude. The signal is modulated with a 1 kHz sine wave, pausing to adjust the RF signal level or the switch coupling devices as necessary. The sweep rate shall not exceed 1.5×10^{-3} decades/s. The step size shall not exceed 1 % of the start and thereafter 1 % of preceding frequency value where the frequency is swept incrementally.
- d. The dwell time at each frequency shall not be less than the time necessary for the EUT to be exercised, and able to respond. Sensitive frequencies such as clock frequency(ies) and harmonics or frequencies of dominant interest, shall be analyzed separately.
- e. Attempts should be made to fully exercise the EUT during testing, and to fully interrogate all exercise modes selected for susceptibility.

5.8.4 DEVIATION FROM TEST STANDARD

No deviation.

5.8.6 TEST RESULTS

INPUT POWER	24Vdc	ENVIRONMENTAL CONDITIONS	22 deg. C, 58% RH, 1014 hPa
TESTED BY	Andy Chang		

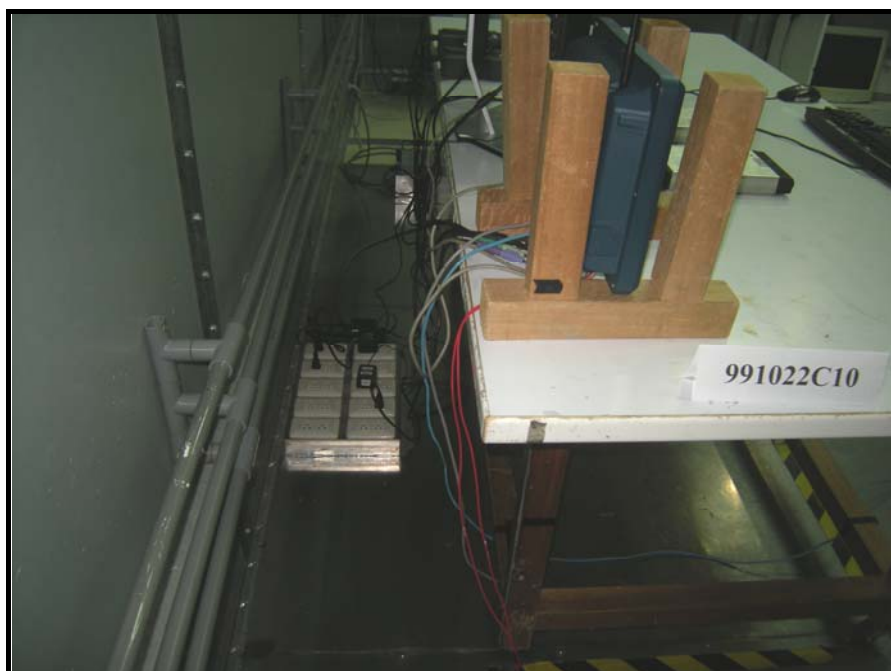
Frequency Band (MHz)	Applied Voltage (Vrms)	Tested Line	Injection Method	Observation	Performance Criterion
0.15-80	10	DC Power line	CDN-M3	NOTE	A
0.15-80	10	LAN cable	Clamp	NOTE	A
0.15-80	10	RS232 cable	Clamp	NOTE	A
0.15-80	10	VGA cable	Clamp	NOTE	A

NOTE:

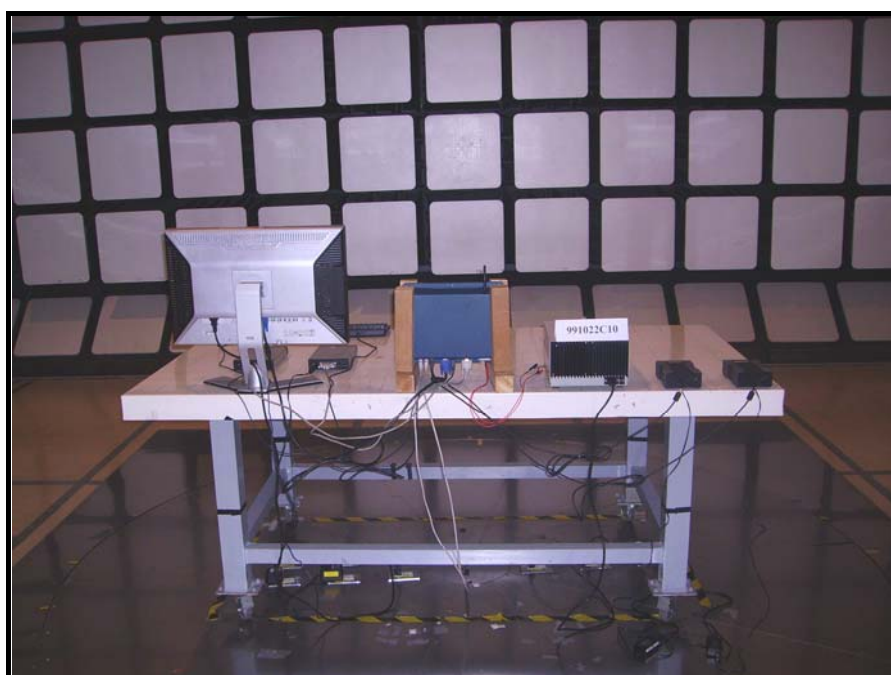
1. There was no change compared with initial operation during and after the test.
2. The touch screen and monitor display functions were evaluated during and after test.
3. Per client's requirement, the EUT used shielded LAN cable during the test.

6 PHOTOGRAPHS OF THE TEST CONFIGURATION

Conducted Emission Test



Radiated Emission Test



ESD Test



RS Test



EFT Test (DC power line)



EFT Test (LAN cable)



EFT Test (RS232 cable)



EFT Test (VGA cable)



Surge Test



CS Test (DC power line)



CS Test (LAN cable)



CS Test (RS232 cable)



CS Test (VGA cable)



7 INFORMATION ON THE TESTING LABORATORIES

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab

Tel: 886-3-3183232

Fax: 886-3-3185050

Email: service@adt.com.tw

Web Site: www.adt.com.tw

The address and road map of all our labs can be found in our web site also.

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